

Application Serial No. 10/067,762

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REMARKS

After entry of this Amendment, claims 1-20 and 23-31 are pending in the application. Claims 21 and 22 have been cancelled without prejudice to filing a divisional application. Claims 1 and 31 have been amended to more particularly point out and distinctly claim the subject matter which applicant regards as the invention. Reconsideration of the application as amended is requested.

Applicant's attorney wishes to thank the Examiner for the courtesies extended to William Hanlon and Michelle Knight on December 10, 2003 during a personal interview conducted with the Examiner. During that personal interview, applicant's representatives presented and discussed a statement by John A. Bugel previously presented in a Declaration Under 37 C.F.R. §1.132 defining the differences between the cited prior art reference and the present invention. Applicant's representatives noted that the invention has a rigidity such that a loss of motion is less than 40% in the present invention. The Examiner recommended placing language indicating this distinction in the independent claims, perhaps noting it in terms of the arm motion. It is submitted that independent claims 1 and 31 have been amended to incorporate this distinction as suggested by the Examiner. The specification has also been amended to be consistent with the drawings and claim language presented in this Amendment. As previously discussed in the prior After Final Amendment, based on the Examiner's prior reliance on the Asano (U.S. Patent No. 4,783,610) reference, it is noted that Figure 4 discloses a prior art configuration which is believed to correspond with U.S. Patent No. 4,570,095 issued to Uchikawa on February 11, 1986 which was previously cited to the Examiner. In order to clarify for the Examiner the specific teachings of the Uchikawa reference with respect to the present invention, a §132 Declaration was prepared and previously submitted with the prior amendment. This Declaration by someone skilled in the art points out that the Uchikawa reference specifically states that column 5, lines 30-35 that the theoretical deflection (i.e. the stroke distance) of the printing needle 9 becomes about 1.0 mm., and that the theoretical deflection is somewhat reduced due to the deformation loss of both the lever arms 5 and 6 and the base 2, so that the actual deflection is about 0.6 mm. The

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Uchikawa reference therefore teaches a device which has a loss of approximately 40% of the theoretical deflection resulting from the stroke distance of the actuator. For purposes of comparison, it should be noted that the estimated loss for the Uchikawa arm movement (excluding the additional band spring 10 movement) is believed to be greater than 40% loss. The claimed invention in the present application is substantially more rigid than the Uchikawa reference, and provides a loss of less than the 40% loss taught by the Uchikawa reference. The Examiner's consideration of the §132 Declaration previously submitted is requested.

The Examiner's attention is also directed to U.S. Patent No. 4,675,568 (previously submitted with Information Disclosure Statement dated November 8, 2002 Sheet 4 of 5), where the Uchikawa applicant describes structure apparently similar to the Uchikawa reference of U.S. Patent No. 4,570,095 as follows:

To solve this problem, one of the inventors of the present invention has described a mechanical amplification mechanism which is disclosed in the U.S. patent application Ser. No. 591,981 [sic: note, this does not appear to be the correct Serial No.], filed on Mar. 27, 1984 and is assigned to the same assignee. The mechanism includes two lever arms respectively fixed to two movable ends of a piezoelectric element. These arms extend perpendicularly to the direction of expansion and contraction of the piezoelectric element. Free ends of those arms hold a band spring therebetween. The band spring has an acting element such as a printing needle or a switch terminal at its central portion. Each of the two lever arms is pivotably supported on a base plate by a fulcrum member located at the position between the fixed end and the free end of the lever arm. The base plate is fixed to a frame member to install the amplification mechanism. Accordingly, the two lever arms turn around the fulcrum members in response to an expansion of the piezoelectric element, so that their free ends approach each other. As a result, the two lever arms bend the band spring forwardly, thus causing the acting

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element to be driven in the direction perpendicular to the expanding direction of the piezoelectric element.

According to this mechanism, the expansion of the piezoelectric element is amplified by the two lever arms and the band spring. Therefore, a sufficient stroke, e.g., 0.6 mm, of the acting element can be obtained with the small-sized mechanism, which is necessary for a printer head and a relay.

However, the lever arms are connected to the base plate with small contacting portions defined by the fulcrum members. Moreover, the piezoelectric element and the band spring are supported by the two ends of the lever arms. Therefore, the lever arms and the band spring tends to be distorted with respect to the base plate. As a result, it is difficult to keep the actuating element in a stable and precise position with respect to the base plate which is fixed to the frame or housing. In particular, where a plurality of the printer heads are arrayed in parallel as applied to a line printer, it is difficult to array a plurality of the actuating elements in a line with high precision.

Further, the base plate is surrounded by the piezoelectric element and movable members, i.e., lever arms and band spring. It must hang in the space on a shaft-like member in order to install the mechanism. Therefore, the installation can not easily be carried out and high precision cannot be realized for the positioning adjustment of the mechanism.

(See Column 1, line 58 through Column 2, line 39 of U.S. Patent No. 4,675,568.) Clearly by the Uchikawa applicant's own admission, the reference does not teach or suggest a "rigid" structure as defined in the claims of the present application and as set forth in the §1.312 Declaration previously submitted.

It is respectfully submitted that this Amendment traverses and overcomes all of the Examiner's objections and rejections to the application as originally filed. It is further submitted that this Amendment has antecedent basis in

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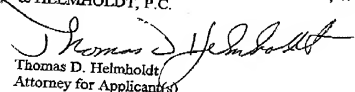
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the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Reconsideration of the application as amended is requested. It is respectfully submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the Applicant's attorney at the telephone number listed below.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD
& HELMHOLDT, P.C.



Thomas D. Helmholtz
Attorney for Applicant(s)
Registration No. 33181
(248) 649-3333

3001 West Big Beaver Rd., Suite 624
Troy, Michigan 48064-3107

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TDH/cmp